DOCUMENT RESUME

ED 098 954 IR 001 333

AUTHOR Rothenberg, Sidney; Vastbinder, Sherry
TITLE The Role of Educational Technology in the Education of Handicapped Learners.
INSTITUTION National Center on Educational Media and Materials for the Handicapped, Columbus, Ohio.
PUB DATE [73]
NOTE 18p.

EDRS PRICE MF-$0.75 HC-$1.50 PLUS POSTAGE
DESCRIPTORS Audiovisual Aids; Educational Technology; *Handicapped Students; *Instructional Design; *Instructional Technology; *Special Education; State of the Art Reviews; Students; Teachers

ABSTRACT

A rationale for using technology in the education of the handicapped is presented in the monograph and specific areas for developing this use in the future are proposed. The monograph begins with a discussion of instruction: how it has been viewed, how it is viewed today, and how it should be conceptualized to accomodate handicapped learners in the future. Following this is a discussion of the terms, "instructional technology" and "handicapped learner." Next, the discussion of the instructional process, instructional technology, and the handicapped learner provide a basis for a discussion of the role of educational technology in special education. The concluding section of the monograph focuses on three major areas which need to be developed to facilitate the use of educational technology in special education: instructional design, the learner, and the teacher. (Author/WH)

ED 098954

THE ROLE OF EDUCATIONAL TECHNOLOGY IN THE EDUCATION OF HANDICAPPED LEARNERS

Sidney Rothenberg, M.A.
Sherry Vastbinder, M.A.

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Introduction

Educational technology has become increasingly important in the instruction of handicapped learners. With the growing emphasis on instructional objectives, systematic approaches to instruction, and individualized instruction, teachers of the handicapped are coming to realize how much technology can help in meeting the specialized needs of handicapped learners.

The purpose of this monograph is to present a rationale for using technology in education of the handicapped and to propose specific areas for developing this use in the future. This monograph begins with a discussion of instruction: how has it been viewed, how is it viewed today, and how should it be conceptualized to accommodate handicapped learners in the future? This is followed by a discussion of the terms, "instructional technology" and "handicapped learner." Traditionally, instructional technology has been thought of as "audiovisual aids." Is this concept still adequate? Similarly, how do we view handicapped learners? Is a "handicapped" learner the same as an "exceptional" learner? If not, how must the handicapped learner be defined? These discussions of the instructional process, instructional technology, and the handicapped learner provide a basis for a discussion of the role of educational technology in special education.

The concluding section of this monograph focuses on three major areas which need to be developed to facilitate the use of educational technology in special education: instructional design, the learner, and the teacher. What do we need to know about the learner? What do we need to know about the teacher? Are there principles of instructional design which might help us to facilitate the effective interaction of the learner and the teacher in an instructional setting?

Instruction

Visualizing an instructional setting of the future, George Leonard (1968) described the impressions of parents visiting their child in school as follows:

> No matter how many times you visit the Basic Domes, its initial effect is literally stunning. It takes a while for the nervous system to begin processing; first, you have to surrender to the overwhelming sensory bombardment that comes from every side. There are, around us, 40 learning consoles, at each of which is seated a child between the ages of three and seven, facing outward toward the learning displays.

HR 001 333

> Each child sits at a keyboard, essentially less complex than that of an old-fashioned typewriter, but fitted with a number of shifts so that almost every symbol known to human cultures can be produced. The child's learning display, about 10-feet square, is reflected from the hologram-conversion screen that runs all the way around the inner surface of the dome (pp. 147-148).

Others (Fuller, 1962; Illich, 1971; Dale, 1972) have suggested similar views of future educational situations. According to these writers, instruction in the future may take place in a building designated as a school; it may, however, also occur outside of school. Dale (1972) wrote: Education would be a system where "everyone is in school and school is everywhere (p. 18)." In the future, school will not be so much a building as it will be an environment.

In this environment, learners will be free to choose from available resources and to progress at their own pace and according to their own interests, "cafeteria style." The substance of learning might consist of courses, program materials, a conversation--or combinations of these. Teachers will serve as managers of these learning resources and use various instructional strategies to structure, facilitate, and help bring together the learner and the resources of learning to achieve specific objectives.

Several implications for the instructional setting are apparent. One implication is that education will be based on a theory of learning that focuses not only on environmental stimuli (Skinner, 1953), but also on the innate capabilities and potential of the learner (Piaget, 1952; Bruner, 1960). It follows, then, that instruction must be individualized. Haring and Hayden (1972) wrote:

> It is obvious that with the 'lock step' progression, teachers are inevitably committed to spending a large fraction of their time in teaching faster students what they already know and in teaching slower students what they are not ready to learn. The result is boredom for some and frustration for others. The recent attempts to individualize instruction so that each student can proceed at his own rate will probably be seen as one of the greatest improvements in instructional design and efficiency of the latter half of the twentieth century (p. 26).

Recent attempts to implement individualized instruction have frequently taken the form of programmed materials, sometimes utilizing devices such as teaching machines or computer terminals. Programming, however, is simply arranging material to be learned into a series of sequential steps, which move the student from a familiar background into a complex and new set of concepts and understandings (Cook, 1964).

Individualizing learning goes a step beyond mere sequential arrangement of materials and considers the learner's objectives and needs. Instruction, then, is clearly a systematic process. Popham and Baker (1970) have identified these four basic steps in instructional design.

1. Specification of objectives;

2. Pre-assessment of learner behavior;

3. Design of instructional sequences;

4. Evaluation of learner achievements.

Instruction, therefore, involves a planned sequence of events, with identified objectives, learning experiences, and measurable outcomes.

Lumsdaine (1963) attempts to bring together these implications in his definition of instruction:

> Instruction is used as a generic term referring to any specifiable means of controlling or manipulating a series of events to produce modifications of behavior through learning. It is applicable whenever the outcomes of learning can be specified in sufficiently explicit terms to permit their measurement.

Corey (1971) presents a similar definition. He defines instruction as the "process whereby the environment of an individual is deliberately manipulated to enable him to learn to emit or engage in specified situations (p. 6)."

Commenting on his and Lumsdaine's definition, Corey admits that the statements suggest a conditioning theory. The intent, however, is towards humanistic concerns. For example, the expression "deliberately manipulated" implies that someone is being made to do something against his will. Each person, however, is free to not respond to environmental stimuli. And in answer to the critics who point to the control and lack of creativity, Corey explains that "even creativity must be described as a kind of behavior if it is to be induced and subsequently observed as a consequence of instruction (p. 7)."

Others have defined instruction similarly, but emphasize that instruction is a process concerned with both external and internal variables (Siegel, 1967; Haring and Hayden, 1972). In other words, materials can be arranged, but the student's motivation to use the materials must also be considered. For Siegel, instruction is "the institution and arrangement of the external conditions of learning in ways which will optimally interact with the internal capabilities of a learner, so as to bring about a change in these capabilities (p. 295)."

To deal with today and to accommodate tomorrow, the following definition of instruction is offered:

> Instruction is the systematic process of structuring the environment of a learner to achieve specific objectives. These objectives should have the greatest potential to fulfill learner needs and to instill learner motivation.

This definition appears to be valid and realistic and should apply as the directions and trends in education change.

Instructional Technology: What is it?

The Commission on Instructional Technology, in its report to the President and the Congress of the United States (1970), defined instructional technology in two ways. The first definition reflected the more familiar meaning--the media, the textbook, the blackboard, and other items used for instructional purposes by the teacher. For this definition, the Commission looked at the pieces of instructional technology: television, films, overhead projectors, computers, and the other items of "hardware" (machines) and "software" (programs). "In nearly every case, these media have entered education independently, and still operate more in isolation than in combination (p. 19)."

In the second definition, instructional technology looms greater than the sum of its parts. This less familiar definition of instructional technology goes beyond any particular medium or device. The Commission defined instructional technology as "a systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication, and employing a combination of human and nonhuman resources to bring about more effective instruction (p. 19)."

The Commission further suggested that "perhaps technology's greatest boon could be to make education more democratic. In the conviction that technology can make education more productive, individual, and powerful, making learning more immediate, give instruction a more scientific base, and make access to education more equal, the Commission concluded that "the nation should increase its investment in instructional technology, thereby upgrading the quality of education, and, ultimately, the quality of individuals' lives and of our society in general (p. 7)."

The Commission's study showed that one-shot injections of a single technological medium are ineffective. Educators must embrace instructional technology as a system and integrate a range of human and nonhuman resources into the total educational process.

Armsey and Dahl (1973), in a report for the Ford Foundation, studied the current and possible future uses of instructional technology. In their report, the term "instructional technology" was defined as the "things of learning," the devices and the materials that are used in the processes of learning and education. However, other definitions were recognized. For example, the authors noted that J. R. Gass, Director of the Organization for Economic Cooperation and Development's Center

for Educational Research and Innovation, Paris, France, defined educational technology (often used synonymously with instructional technology) as the organized design and implementation of learning systems that take advantage of, but do not guarantee miracles of, modern communications methods, visual aids, classroom organization, and teaching methods.

Another example was the definition proposed by Britain's National Council on Educational Technology (NCET). In a 1971 Working Paper the NCET concluded that educational technology "involves the application of systems, techniques, and aids to improve the process of human learning." NCET expanded this description as follows:

> It is characterized by four features in particular: the definition of objectives to be achieved by the learner; the application of principles of learning to the analysis and structuring of the subject matter to be learned; the selection and use of the appropriate media for presenting material; and the use of the appropriate methods of assessing student performance to evaluate the effectiveness of courses and materials (p. 2).

According to Armsey and Dahl, media has also been viewed not as an end, but rather as a means to optimize the learning process. For example, Henri Dieuzeide, Director of UNESCO's Division of Methods, Materials, and Techniques, includes in the realm of educational technology, "all the intellectual and operational efforts made during recent years to regroup, arrange, and systematize the application of scientific methods to the organization of new sets of equipment and material (p. 2)."

Other definitions discussed by Armsey and Dahl are the ones by UNESCO, R. Louis Bright, and the National Academy of Engineering. UNESCO considered the difference between educational technology and instructional technology to be dependent on size and duration. Educational technology refers to large-scale, long-term projects, while instructional technology refers to small-scale, shorter-term projects. Bright refused to limit educational technology to hardware. He considered it an instructional theory or an approach that may or may not involve hardware. The National Academy of Engineering defined educational technology as "the body of knowledge resulting from the application of the science of teaching and learning to the real world of the classroom, together with the tools and methodologies developed to assist in these applications (p. 3)."

Regardless of the interpretations, neither educational nor instructional technology is an end in itself. Rather, the technology is a means to accomplish some predetermined, clearly defined, unambiguous educational objectives.

The Handicapped Learner: Who Is He?

One serious problem in identifying and describing educational programs for children considered uneducable in centuries past is that the term

"exceptional child" is applied to such a diverse array of children that it does not convey precise meaning (Rossmiller, 1969).

Kirk's definition of the exceptional child is "that child who deviates from the average or normal child in mental, physical, or social characteristics to such an extent that he requires a modification of school practices, or special educational services in order to develop to his maximum capacity (1962, pp. 4-5)."

This definition emphasizes that a child's exceptionality must be educationally significant. This point of view also was reflected by Barbe when he stated, "'Exceptional' refers to children who differ from the average to an extent that their differences warrant some type of special school adjustment, either within the regular classroom or in special classes (1963, p. 2)."

For the purposes of this paper we will further delineate the definition from "exceptional child" to "handicapped learner" because the former term would include the gifted learner who will not be considered.

Paul Andereck (1973), from the Bureau of Education for the Handicapped (BEH), considers a learner handicapped when the learner's behavior is sufficiently deviant to make the learning experience totally or largely unprofitable. If the deviant behavior can be attributed to environmental factors, we call the learner "disadvantaged." If the deviant behavior can be attributed to physical incapacity (sometimes compounded by an inappropriate environment), we call the learner "handicapped."

Stephens (1970) writes that classifications derived from etiological thinking seldom have educational relevance and do not suggest directions for teaching or curriculum development. The reference terminology that is based on the biological conditions of children usually carries three implications. First, body deficits are assumed to cause inadequate behavior. Second, the reference suggests that by identifying physical disabilities, teachers can change the behavioral responses of children. Third, educational treatment is often equated with medical treatment. Such implications are important to those engaged in prevention of disabilities and in treatment, but the primary concern of educators should be to teach children who have acquired the biological conditions that are presumed to cause learning and behavioral handicaps. The term "handicapped" is intended to convey the concept of burden. The learner feels this burden when faced with educational situations that cannot be resolved due to body dysfunction or impairment. Thus, teachers are confronted with the consequences of the child's handicap.

Marshall (1973) further illustrates characteristics of the handicapped learner. According to Marshall, students exhibiting growth deficits incurred from sensory and nonsensory etiologies of deprivation are less able to profit developmentally from the customary levels of environmental stimulation. Educators of the handicapped (especially the hearing impaired), therefore, agree to the following five educational characteristics: (1) it takes several years longer to educate their students

than would otherwise be the case; (2) the communication of message-information units is perceptibly more difficult; (3) the student's participation in the learning process is eminently desirable; (4) sources of immediate feedback provided to the student-learner are self-encouraging; and (5) sources of feedback to the teacher/learner-manager are critical for the pacing and directioning of the future instructional effort.

Almost all children, at some time in their lives, exhibit learning problems or display inappropriate behavior; but those who demonstrate persistent difficulties in these areas are the handicapped learners.

The Role of Instructional Technology in Special Education

Recently it was reported (Perrin, 1970) that only one in three handicapped children is receiving special schooling. Perrin described the consequences for the remaining two-thirds of the handicapped population as follows:

> The remainder are a burden to themselves and their teachers in regular classrooms. Some are in hospitals and institutions, and some stay at home, relegated to the electronic baby-sitter. Instead of realizing whatever potential does exist in these children, they become outcasts of society--misfits--sometimes totally unable to take care of themselves, and unable to make any kind of contribution to their own upkeep, let alone find useful employment in the society in which they live (p. 40).

In attacking this problem, Perrin concludes, "educational technology will be, and in some cases already is, a powerful weapon (p. 40)."

Martin (1970) also observed that instructional technology will have an impact in areas of special education, but particularly in providing systems and resources for making relevant educational materials readily available to the handicapped. Another advocate of the use of instructional technology in special education, Haring (1970) observed that a dominant factor in curriculum design in special education is the increasing use of print and nonprint media to achieve terminal objectives. Curriculum design in special education, Haring suggests, will incorporate technology to the fullest.

Clearly, instructional technology will play a major role in special education. "In many respects the role of educational technology in special education will parallel general education, but since the student's need is greater, the utilization of technology (in special education) will be greater (Perrin, 1970, p. 42)."

Traditionally, media has the potential to affect instruction by (1) heightening motivation for learning, (2) providing experiences that are delightfully new and varied, (3) making subject matter clearer and more

appealing to students of diversified backgrounds and abilities, (4) encouraging student participation in learning, (5) giving needed reinforcement, (6) widening the range of instructional experiences, (7) assuring order and continuity of thought in the presentation of material, and (8) providing the student with an opportunity to learn through alternative mediums (Dale, 1969).

The new thrust is to utilize media and materials in an individualized, systematic, instructional program designed to accomplish specific objectives. With this approach, media becomes an integral part of a carefully planned instructional system (Heinrich, 1968). Media will "provide a vehicle for special education to expand and enrich the sensory world of the handicapped child in such a way that it both expands his real world and enhances the store of experiences upon which he can build his communication skills (Gough, 1968, p. 561)."

Studies of the use of audio and visual modes of communication reveal the significance of media in amplifying, clarifying, and organizing sensory inputs. Genensky (1970) reported on the use of closed circuit television in educating the partially sighted. Using the image enhancement quality of closed circuit television, individuals who are unable to read printed or handwritten material or to write with a pen or pencil are assisted in both their reading and writing. The implications of Genensky's work are easily recognized.

> Closed circuit TV systems could be placed in libraries and resource rooms which are used by partially sighted students throughout the country. With such devices, these students could read any book that is available to a normally sighted student, take notes, write compositions, do mathematics, draw pictures, and carry on all the other activities involved in obtaining an academic education..... They would be less dependent upon the availability of large-print books, taped or recorded information and sighted readers (pp. 29-30).

Working with the audio mode, Enc and Stolurow (1960) studied the effect on the learning and retention in blind subjects of two recording speeds. The researchers used "talking book materials" to prepare audio tapes, including a fast version and a slow version. In each version, the narrator adjusted the rate of speech within prescribed limits. Results showed that the blind who learned with the fast version scored higher and retained more information after 24 hours than a comparable group using the slow version. Studies in the related area of rate controlled speech (that is, compressed or expanded speech) have also shown that individuals vary in their ability to understand differing rates of speech, indicating audio materials should be available in compressed versions as well as normal-rate versions (Foulke and Sticht, 1969).

Aserlind (1966) reviewed studies that used audiovisual modes to teach the retarded. He found that "studies which specifically investigated

utilization of audiovisual materials and methods with the mentally retarded have almost universally indicated good results." In a study of young retarded adults (IQ's 60-80), using audiovisual materials to teach job skills, the subjects unanimously preferred the audiovisual method over the conventional method (Neuhaus, 1964). Another study showed that systematic overlearning of sight vocabulary could be achieved efficiently and effectively through audiovisual methods (Vergason, 1966). Repetitions necessary for learning with some retarded are more easily accomplished with slide projectors, tape recorders, and other media. Still another study showed that motion pictures facilitated the learning of food serving concepts by educable mentally retarded (Goldstein, 1964). Learning was attributed in part to the concrete, realistic visualizations in the films.

In a summary statement, Aserlind points out that audiovisual instruction for the mentally retarded is different from the use of similar materials with the normal child. "This may mean utilizing audiovisuals as a training or developmental medium in such specific areas as perception, differentiation, attention, visual scanning, and retention, to name a few (p. 730)."

An important and frequently neglected characteristic of media is its apparent motivational capability. This aspect is observed particularly with programmed instruction. In a review of 14 projects using programmed learning with the educable mentally retarded, Stolurow (1963) observed that in a study of an automated basic spelling program, teaching machines held a certain "play appeal." Pfau (1970), in speaking of the deaf, also observed that teaching machines have a high motivational value. Pfau points out, however, that the "machine per se is not intrinsically motivating (p. 15)." The materials must be meaningful, challenging, and interesting.

Another application of programming has been with computers. Tondow (1964) points out that the computer's capability for storing and retrieving large amounts of data facilitates the necessary individualization and one-to-one dialogue that is so important in special education. "A pattern of dynamic diagnosis based on actual behavior and thus a tailored program becomes a reality for each pupil (p. 115)." The capacity for reinforcement and self-paced learning also serves as a motivating factor. Successful computer assisted programs for the deaf in a variety of subject areas support Tondow's observations (Suppes, 1971).

Media's capacity as a highly affective and engaging presentation form is also evidenced in television. A popular example of this is the highly acclaimed series, "Sesame Street." Evaluations of the programs indicated that the major objective of improving cognitive skills was achieved (Ball and Bogatz, 1970). But like other forms of communication, television produces unintended messages. Sproull (1973) investigated three unintended effects of "Sesame Street:" visual attention, modeling behaviors, and other verbal and nonverbal forms of communication. Thirty pre-kindergarten, white, predominantly middle class children were videotaped either as single viewers or as group viewers of a "Sesame Street"

program. Videotapes were coded systematically for visual attention, modeling behaviors, and other communication. Results showed that group viewers maintained eye contact with 81 per cent of the program, in spite of the distraction of other children poking each other, blowing in each other's ears, and talking with one another. Other findings indicated a large number and variety of modeling behaviors and vicarious participation in program situations. Sproull concluded that "television is a commanding medium and thus is a most appropriate tool to help individuals learn (p. 113)."

The processing of perceptual information through touching, handling, and manipulating objects and gross motor responses are essential for all handicapped learners (Ensminger, 1972). Here again, media has been shown to assist in providing environmental stimulation for necessary concrete experiences. Montessori (1964) used objects such as wood blocks, sand, and pebbles to teach sense and muscle discriminations. In a way, recent efforts to put media into the hands of learners may be seen as an extension of the view that each child should have an opportunity to create his own learning environment. People must be taught how to use the electronic media not only to receive but to send messages. The field of special education should take the road that points toward direct experience of the media (Shayon, 1973, p. 15).

Just as media brings experiences into the classroom, media can also serve to extend the classroom to homes, day care centers, hospitals, or institutions. The use of mediated instructional systems, such as computer assisted instruction, with "home" or "local" control capabilities has been documented (Jogner and Stimbert, 1971; Jerman, Clington, and Sobers, 1971). Viewing television (such as "Sesame Street") has proven to be successful in planned learning outside (and inside) the classroom. "Even though television, radio, and other forms of telecommunications may be primarily perceived, at least in the United States, as means of entertainment or as commercial media, their utilization in educational programs awaits the awakening of educators (Ghatala and Wedemeyer, 1973, p. 63)." In special education, where learners are sometimes homebound, where the availability of qualified teachers is limited, where the optimization of usable senses is crucial, this statement is particularly relevant.

Problem Areas: Variables to be Considered

Clearly, the role of instructional technology in the education of handicapped learners is an important one. The question is not, therefore, whether or not instructional technology has a role to play, but what are the most effective means for fulfilling that role? Three major areas for effective action are identified here as: instructional design, the learner, and the teacher.

Instructional Design. The great variability of learning problems among exceptional children makes the selection and/or development of instructional materials a very difficult process. Much of the learner's

education is directly dependent on the materials presented to him in his instructional program. If the materials fail to engage his attention or if his use of the materials with teacher guidance fails to produce the desired results, he is denied valuable learning experiences (Ensminger, 1972).

Instructional design is basically an unexplored frontier of theory and research, and the "educational designer" is but a pioneer. The functions of the "educational designer" have yet to be clarified, let alone be implemented in instructional practice beyond the most rudimentary beginnings. There are no texts or guidelines appropriate for use in designing instructional media-messages, nor do we possess a sufficient body of experimental knowledge that can provide a basis for such design (Saettler, 1968).

Freeman (1924) reported on the series of experiments conducted at the University of Chicago in the early 1920s. This study was the first systematic, experimental investigation of relevant variables in instructional media and was the first to use experimentally designed media for such comparative purposes. Unfortunately, the research areas opened by the classic Chicago experiments were not developed further.

Weber (1930) pointed out that no further experimentation on the comparative value of media was needed, and recommended that researchers study the problems of individual differences and of interrelationships between animation and other psychological factors. The next fifteen years, however, brought forth additional media comparison studies that generally produced "no significant differences."

Reid and Machennan (1967) state that most of the volumes of research on instructional television over the past decade were studies of media comparison. Obviously, media comparison studies have predominated. Knowlton (1964) observed that in most of these studies the addition of a medium, not the message variable, was considered to be the variable under investigation. He noted that these studies failed to reveal any significant information about media, since experimental designs of the studies did not analyze or separate the physical characteristics of the medium from the sign vehicles of the message carried by the channel.

The development of a scientific technology of instruction has been stifled by the serious lack of relevant theory and by the plethora of experimental evidence. Although the task of integrating large bodies of empirical data about instruction has been begun, nothing less than a concerted effort by behavioral scientists, teachers, media and communications specialists, and philosophers will make the science and technology of instruction educationally effective (Saettler, 1968).

There is an urgent need for a taxonomy of instructional media that can provide guidelines for the systematic selection and use of media for educational purposes. Without a taxonomy, the field of instructional design may continue to develop randomly.

Learner Variables. If attention could be focused first on the learning variables, why the person does or does not meet the criteria of progress, then the learner's needs in terms of instructional materials or media might be evident. We could then consider how these individual needs could be met even in group instruction. Briggs (1968) points out, however, that in instructional design, it is backwards to select ability grouping or branching programs, because one cannot know whether a branching program is the proper method for adapting to individual needs before he knows what the individual needs are.

Stephens (1970) writes that teachers of children with learning and behavioral handicaps must have considerable knowledge of their students and the instructional materials to plan instruction. To select relevant media, the teachers must first have access to information concerning which academic skills have already been acquired by their students. Second, teachers of such children must also have a knowledge of which sensory modalities are most effective for learning by each child. Third, the teachers must have ready access to a wide variety of instructional media that can be ordered and made available on short notice. It is hoped that the practice of training teachers about instructional materials prior to working with the instructional needs of each child is vanishing from the schools. Practices which permit quick distribution of needed materials after teachers have had exposure to those children in need of special instruction are highly recommended.

It is fruitless to hope to find evidence of the possibility of matching a specific medium with an individual learner or subject matter area; instead, educators should consider learner characteristics while analyzing tasks with respect to the optimum kind of stimuli and learning conditions (programming strategies) that can be provided by various media (Gagne, 1965; Briggs, Campeau, Gagne, and May, 1967).

With greater specificity in teaching children with learning and behavioral handicaps, the practice of cross indexing cataloged materials will become more prevalent and will provide the precision necessary to respond to teachers' requests (Stephens, 1970).

Teacher Variables. Effective teaching takes place when classroom activities are clearly related to specific outcomes (Stephens, 1970). The typical manner in which objectives are stated does little to lessen, and may even increase, the difficulty of their attainment (Edling, 1968). Paulson (1967) attempted to summarize the case against specifying instructional objectives and indicated that the majority of educational objectives are "fundamentally fraudulent," having the "capacity to deceive both those expressing them and those to whom they are expressed." Further, they may be used "both to camouflage our confusion and to propagandize the public." Yet, he concluded that any substantial and durable improvement in instruction probably would be impossible without them.

Some educational media have had profound influence on methods of stating educational objectives. Gagne (1965) makes a distinction between

two major types of instructional conditions that he terms "extemporaneous design" and "pre-design." Extemporaneous instruction is primarily associated with the human medium because instructional conditions are designed "on the spot" as instruction proceeds. In this situation, specific objectives and predetermined goals seem less relevant than with less flexible media. Many nonhuman educational media, however, including those with electronic, mechanical, and photochemical components, frequently employ "software" that must be preplanned and stored for use when required. This requirement for preplanned materials has created an ever-increasing need for a new kind of educational objective. According to Paulson (1967) this new kind of objective should meet three criteria: (1) it is defined clearly enough so that we can recognize it; (2) we can carry out whatever activities are necessary to make it occur; and (3) we seriously intend to achieve it, even at considerable cost.

The one procedure that apparently meets these criteria involves an explicit description of learner behavior in terms that make the behavior observable and measurable (Mager, 1962). In addition, the goal must be attainable. Thus, when a behavioral objective has been identified, it may be possible to develop technological media to attain it. These behavioral objectives provide the specifics necessary to evaluate whether the preplanning has been appropriate and adequate (Edling, 1968).

Bialeck (1967) investigated how teachers perceive the importance or desirability of objectives. He reported, in part, that many teachers apparently do not feel that it is essential for certain categories of students to reach any objectives at all.

If a class of trainable mentally retarded children fail to learn anything in a year's time, where does the responsibility lie? If the teacher were confronted, the teacher could relate the failure to characteristics of the children. With the advent of accountability, the teacher will be held responsible, regardless of the student's intellectual level (Vergason, 1973).

The personal accountability of teachers should begin with the assessment of children's strengths and weaknesses (Stephens, 1970; Vergason, 1973). Each teacher should establish for each child the expected levels of performance within a specified time, that is, objectives and terminal criteria. Progress should be systematically and frequently evaluated, in terms of specific objectives (Mager, 1962; Stephens, 1970).

Large expenditures will be required to develop adequately specific behavioral objectives, perform the detailed analyses required, and empirically refine prototype materials until they are demonstrated to be effective, especially when there are so many objectives in education. Unless costs can be amortized over many learners, it may not be feasible to expend the amounts required to establish the desired congruence between objectives and media. Media make possible, however, the presentation of refined materials to unlimited numbers of learners (Edling, 1968).

Presently, research on individually prescribed instruction at the University of Pittsburgh Research and Development Center and investigations of instructional management systems at the System Development Corporation constitute the major attempts to clarify teacher roles with media-based instructional systems.

REFERENCES

Andereck, P. Testimony to Congressional Committee on the Education of the Handicapped Act, 1973.

Armsey, J. W., and Dahl, N. C. An inquiry into the uses of instructional technology. New York: Ford Foundation, 1973.

Aserlind, L. Audiovisual instruction for the mentally retarded. Audiovisual Instruction, 1966, 11, 727-730.

Ball, S., and Bogatz, G. A. A summary of the major findings in the first year of Sesame Street: An evaluation. Princeton, N. J.: Educational Testing Service, 1970.

Barbe, W. B. The exceptional child Washington, D. C.: Center for Applied Research in Education, 1963.

Bialek, H. M. A measure of teacher's perceptions of Bloom's educational objectives. Paper presented to the American Educational Research Association, Monterey, California, February, 1967.

Briggs, L. J. Learner variables and educational media. Review of Educational Research, 1968, 38 (2), 160-176.

Briggs, L. J., Campeau, P. L., Gagne, R. M., and May, M. A. Instructional media: A procedure for the design of multi-media instruction, a critical review of research, and suggestions for future research. Pittsburgh, Penn.: AIR, 1967.

Bruner, J. S. The process of education. New York, N. Y.: Vintage, 1960.

Commission on Instructional Technology. To improve learning: A report to the President and the Congress of the United States. Washington, D. C.: USGPO, 1970.

Cook, D. L. Teaching machine terms: A glossary. In J. P. DeCecco (Ed.), Educational Technology: Readings in Programmed Instruction. New York, N. Y.: Holt, Rinehart and Winston, 1964.

Corey, S. M. The nature of instruction. In M. D. Merrill (Ed.), Instruction Design: Readings. Englewood Cliffs, N. J.: Prentice-Hall, 1971.

Dale, E. Audiovisual methods in teaching. (3rd ed.) N. Y.: Holt, Rinehart and Winston, 1969.

Dale, E. Building a learning environment. Bloomington, Indiana: Phi Delta Kappa, 1972.

Edling, J. V. Educational objectives and educational media. Review of Educational Research, 1968, 38 (2), 177-194.

Enc, M. A., and Stolurow, L. M. The effect of two recording speeds on learning. The New Outlook for the Blind, 1960, 54, 39-48.

Ensminger, E. E. A proposed model for selecting, modifying, or developing instructional materials for handicapped children. In E. L. Meyen, G. A. Vergason, R. J. Whelan, Strategies for teaching exceptional children. Denver, Colo.: Love, 1972. Pp. 148-161.

Foulke, E., and Sticht, T. G. Review of research on the intelligibility and comprehension of accelerated speech. Psychological Bulletin, 1969, 72, 5062.

Freeman, F. N. (Ed.) Visual education. Chicago: Univ. of Chicago, 1924.

Fuller, R. Buckminster. Education automation: Freeing scholar to return to his studies. Garden City, N. Y.: Anchor, 1962.

Gagne, R. M. The conditions of learning. New York: Holt, Rinehart and Winston, 1965.

Genensky, S. M. Closed circuit television and the education of the partially sighted. Educational Technology, 1970, 10 (8), 27-31.

Ghatala, M. H., and Wedemeyer, C. A. Telecommunications in education. Educational Technology, 1973, 13 (4), 63.

Goldstein, E. Selective audiovisual instruction for mentally retarded pupils. Springfield, Ill.: Charles Thomas, 1964.

Gough, J. A. Educational media and the handicapped child. Exceptional Children, 1968, 34 (7), 561-564.

Haring, N. G. The new curriculum design in special education. Educational Technology, 1970, 10 (5), 24-31.

Haring, N. G., and Hayden, A. H. (Ed.) The improvement of instruction. Seattle, Washington: Special Child Pub., 1972.

Heinich, R. The teacher in an instructional system. In F. G. Knirk and J. W. Childs, Instructional technology: A book of readings. N. Y.: Holt, Rinehart and Winston, 1968. Pp. 45-60.

Illich, I. Deschooling society. New York, N. Y.: Harrow, 1971.

Jerman, M., Clinton, J. P. M., and Sobers, A. W. A CAI program for the home. Educational Technology, 1971, 11 (12), 49.

Joyner, L. W., and Stimbert, V. E. "Home-Loop" instruction: Some applications to preschool education. Educational Technology, 1971, 11 (2), 46-48.

Kirk, S. A. Educating exceptional children. Boston: Houghton Mifflin, 1962.

Knowlton, J. Q. A socio- and psycho-linguistic theory of pictorial communication. Bloomington, Ind.: Educational Media and A-V Center, Indiana Univ., 1964.

Leonard, G. B. Education and ecstasy. New York, N. Y.: Delacorte, 1968.

Mager, R. F. Preparing instructional objectives. Palo Alto, Calif.: Fearon, 1962.

Marshall, W. J. A. A prototypical systems model for the delivery of media services to the handicapped. Columbus, Ohio: National Center on Educational Media and Materials for the Handicapped, 1970.

Martin, E. Federal programs. In R. L. Jones (Ed.), New directions in special education. Boston: Allyn & Bacon, 1970.

Montessori, M. The montessori method. New York: Schocken, 1964.

Neuhaus, E. C. Audiovisual job training for mentally retarded. Rehabilitation Record, 1964, 32-35.

Paulson, C. F. Specifying behavioral objectives. In National Research Training Institute Manual. Monmouth, Oregon: Teaching Research, 1967. Pp. 1-13.

Perrin, D. Educational technology and the special child. Educational Technology, 1970, 10 (11), 40-42.

Pfau, G. S. Project LIFE: Developing high interest programmed materials for handicapped children. Educational Technology, 1970, 10 (8), 13-18.

Piaget, J. The origins of intelligence in children. New York: Norton, 1952.

Popham, W. J., and Baker, E. L. Systematic instruction. Englewood Cliffs, N. J.: Prentice-Hall, 1970.

Reid, C. J., and Machennan, D. Research in instructional television and film. Washington, D. C.: USGPO, 1967.

Rossmiller, R. Dimensions of educational need. Gainesville, Fla.: National Educational Finance Project, 1969.

Saettler, P. Design and selection factors. Review of Educational Research, 1968, 38 (2), 115-128.

Shayon, R. L. Education, media and identity. Audiovisual Instruction, 1973, 18 (2), 10-15.

Siegel, L. (Ed.) Instruction: Some contemporary viewpoints. San Francisco, Calif.: Chandler, 1967.

Skinner, B. F. Science and human behavior. New York: Macmillan, 1953.

Sproull, N. Visual attention, modeling behaviors, and other verbal and meta-communication of prekindergarten children viewing Sesame Street. American Educational Resourch Journal, 1973, 10 (2), 101-114.

Stephens, T. M. Directive teaching of children with learning and behavioral handicaps. Columbus, Ohio: Charles Merrill, 1970.

Stolurow, L. M. Programmed instruction for the mentally retarded. Review of Educational Research, 1963, 33 (1), 126-136.

Suppes, P. Computer assisted instruction for deaf students. American Annals of the Deaf, 1971, 116 (5), 500-508.

Tondow, M. Computers in special education - An introduction. Exceptional Children, 1964, 31, 113-116.

Vergason, G. A. Retention in educable retarded subjects for two methods of instruction. American Journal of Mental Deficiency, 1966, 70, 683-688.

Vergason, G. A. Accountability in special education. Exceptional Children, 1973, 9, 367-373.

Weber, J. J. Visual aids in education. Valparaiso, Ind.: Valparaiso Univ. Press, 1930.